

## INTESTINAL OBSTRUCTION DUE TO INTUS-SUSCEPTION.<sup>1</sup>

By JOHN F. ERDMANN, M.D.,

OF NEW YORK,

CLINICAL PROFESSOR OF SURGERY IN THE UNIVERSITY AND BELLEVUE HOSPITAL MEDICAL COLLEGE.

IN a paper entitled "Intestinal Obstruction due to Intussusception and Volvulus," read by the writer before the New York State Medical Association, October 19, 1898, attention was called to an assertion made by Dr. Edwin Martin before the Philadelphia Paediatric Society, November 9, 1897, which was as follows: "That he was particularly impressed with the rarity of intussusception, as out of 800 personal communications sent out by him, most of them being answered, the returns brought him records of but fifty-four cases, and that men of the widest experience in surgery, medicine, and paediatrics reported that they had never seen a case." The author of this paper called attention to the statement of Dr. Martin by saying that "such a statement is apt not only to be misleading with reference to the frequency of the disease, but also has a tendency to create an undesirable impression of diagnostic acumen upon the profession at large."

In the paper read before the State Medical Association we cited twelve cases coming under our observation within a few years, eight of which were under the author's own care, the four remaining having been seen with other surgeons. Since publishing the above paper it has been the author's fortune to see two more cases, both of which were operated upon by him, one with success, and the other, which will be considered later, terminated fatally. In the first paper, after citing the twelve

<sup>1</sup> Read before the New York Surgical Society, October 25, 1899.

cases, we remarked that "such a series of cases under the observation of a single operator tends to the belief that the disease is much more frequent than most authors admit." With the two occurring in my practice during the summer months, we cannot but emphasize the foregoing remark, or rather say that the cases are much more frequent than heretofore supposed.

In fully 30 per cent. of all cases of acute obstruction we find intussusception as the cause, and fully 50 per cent. of all cases of intussusception occur in children under ten years of age; again, of these fully 50 per cent. occur under the age of twelve months. The percentage of cases diminishes pronouncedly between the ages of five and forty to fifty years, while after forty to fifty years there is again a noted increase. It has been suggested that the frequency of occurrence in infancy and after the age of fifty years is due to the powers of resistance being far less in extreme youth and old age.

Anatomically we may make the following classification:

(a) Those cases in which the ileo-caecal valve forms the apex of the intussusception, as *ileo-caecal*.

(b) Those cases in which the ileum and caecum pass up into the colon, as *ileo-colic*.

(c) Those cases in which the intussusception is made entirely of small intestines, as *ileal* or *enteric*.

This latter variety has been and is now considered the most frequent, although in a series of seven cases operated upon by the writer four were ileo-colic, one was of the ileo-caecal, and two were of the enteric varieties.

The enteric variety is most frequently found upon autopsy, but these cases are usually of post-mortem origin.

It would seem to the author that all cases might be classified according to the intensity of the symptoms and the time of fatal termination into

Acute, or those dying within seven days.

Subacute, or those dying between one and four weeks.

Chronic, or those dying after a month or more has gone by, rather than the following classification of Raffinesque:

*Ultra-acute*, when death occurs in twenty-four hours.

*Acute*, when death occurs after twenty-four hours and within seven days.

*Subacute*, when death occurs between the seventh and fourteenth days.

*Chronic*, when the condition exists from three weeks to months before a fatal termination.

Intussusception is produced by an irregular peristalsis. Among the chief causative factors of intussusception are:

(a) Former conditions of health,—*i.e.*, preceding physical conditions which have a tendency to reduce the power of resistance well below par, particularly well marked in children suffering from diarrhoea. Under this heading it is stated that a child of robust physique is not so prone to suffer this condition as one of a puny and delicate type. We cannot agree with this, as the majority of our cases were in well-nourished and robust children.

(b) Those of a pathological nature; tumors, those usually involving the internal coats of the intestines; polypi, and endotheliomata; also Meekel's diverticula, as shown in the case reported by the writer in the *New York Medical Journal* of April, 1898.

(c) Causes which may be assigned under the head of anatomical. Of these we have long and lax mesentery or meso-colon, although this could not be demonstrated in any of the operation cases seen by the writer. The musculature of the intestinal wall has recently received considerable attention. The longitudinal fibres are said to contract, thereby retracting a portion of the gut from below into the gut above, while the circular fibres of the portion of gut above contract, thereby grasping the retracted portion. It is also offered as a theory that as a result of the contraction of these circular fibres reduction is prevented.

(d) Sex and nationality as causative factors were as follows:

(1) *Sex*.—In the nine cases reported five were males and four were females.

(2) *Nationality*.—Of the nine cases reported by the writer in this paper, two were of Irish-American, two were of German, and five were of Pole parentage.

Symptoms and signs of diagnostic importance occurred in our cases in the following order of frequency: Pain, shock, vomiting, restlessness, tenesmus, passage of bloody mucus or blood, tumor, obstruction, peritonitis, and sepsis.

Pain has been an ever-present symptom in all the cases seen, the child crying out for some time. The abdomen has been sensitive to touch, manifested by the child, if too young to speak, by flinching or crying.

Shock was evident in the majority of cases, lasting from a few minutes to the time of reduction or death. Vomiting was present in about 50 per cent. of the cases, and these were the cases of more than twenty-four hours' duration. It is well to remember that many of these cases are preceded by diarrhoea and vomiting, which may have been but accompaniments of some pre-existing condition.

*Restlessness.*—The patient moans and tosses or rolls from side to side during the disease, and continues so to do until reduction, sepsis, or gangrene takes place.

There is often an evacuation of faeces, after this condition arises, previous to the passage of mucus and blood; this faecal matter comes from the bowel below the point of obstruction.

The author has not seen a single case in which some evidence of blood was not present.

*Tumor.*—The proverbial sausage-shaped tumor is not always found by palpation. In three of the operation cases no tumor was found, although the ablest diagnosticians in paediatrics had carefully palpated the subjects. In each of these cases the symptom complex was so perfect of intussusception that operation was advised, accepted, and performed. In two of these cases the tumor was found well up under the ribs, in the left hypochondriac region, while in the third it was found under the right lobe of the liver.

In two of the operative cases of the author a small protrusion could be palpated high up in the lower bowel, upon digital examination.

Later the symptom complex changes, obstruction is complete, the pulse is thready and rapid, and manifestations of peritonitis and sepsis are evident.

## THE TREATMENT.

In this disease, as in appendicitis, one cannot urge too strongly against the use of opium. In one of the cases operated upon by me this year, opium had been given, but in such minute doses that the family physician and myself thought no stress should be placed upon the possibility of the masking of symptoms. As a result of the apparent good condition of the child, unfortunately operation was delayed eight hours longer than it would have been had the opium not been given; and I am confident that our result would have been a recovery rather than a death had we operated at the time of our first visit.

The use of water- and air-pressure is justifiable in all cases of less than twenty-four hours' duration, and certainly water should be tried before operative interference is undertaken.

The reservoir should be suspended about three to five feet above the child. The child having been placed in the head-dependent position, either over the back of a chair or suspended by the heels, a few whiffs of chloroform are given to aid very much in restraining the efforts at expulsion on the part of the child, thereby allowing a greater amount of water to enter the bowel. When the intussusception is in the proximal end of the colon, or in the ileum, the water-treatment, as a rule, proves a failure. Massage of the tumor through the abdominal wall, when found, should be practised while the water is entering the bowel. Taxis by the above means should not be practised with any greater degree of frequency and duration than it would be in cases of strangulated hernia,—in other words, should a conscientious attempt at irrigation fail, then the operative procedure is demanded. Children will bear abdominal section very well, and we are quite satisfied that recovery will almost invariably follow in all cases in which operation is done in the first day, and that a very great proportion operated in the first half of the second day will also recover.

The relationship in recoveries from strangulated hernia and intussusception with regard to previous duration are very

similar. The longer the duration the greater the mortality, due to the same cause or causes in each disease,—shock, exhaustion, gangrene, and sepsis.

After exposing the tumor the following procedures are in order: Reduction, artificial anus, entero-anastomosis, and resection with end-to-end anastomosis.

The incision need not of necessity be a long one at the onset, for, if it is a case readily reducible, this can be done through a two- or three-inch incision in children, as well as through a much larger one, provided that the main principle of reduction be observed, and that is that, in reducing the gut, it must not be done by traction, but by the means of gentle pressure exerted through the intussusciens upon the apex of the intussusceptum. This will drive the intussusceptum from within the intussusciens. In our last case we reduced the major portion of the tumor, which occupied the left hypochondriac and lumbar regions, through a small incision and then, when the tumor approached the right lumbar region, the remaining mass was displaced from the abdomen through the small incision and a thorough inspection made. Traction upon the distal and proximal ends is very liable to be followed by lacerations of one or more coats, or a complete rupture of the walls of the intestine.

Pressure need never be so severe as to produce any injury to the integrity of the gut, as in all cases in which there are neither gangrene nor adhesions reduction is readily accomplished. Should the patient's condition demand haste, then and then only should an artificial anus be made, while in the cases in which haste is not a factor, typical resection with end-to-end anastomosis is the operation to perform.

The author would modify the operation of partial resection, as followed by Greig Smith, Barker, and others, by omitting the row of sutures between the intussusceptum and intussusciens, bringing the healthy gut through the longitudinal incision in the intussusciens, then tying off the mesentery, and finally cut off the intussusceptum, completing the operation according to Maunsell, thereby doing a typical resection with end-to-end anastomosis.

The author does not deem shortening or plication of the mesentery necessary, as it seems to him that adhesions form in most of these cases, and thereby obviate the necessity of sutures.

CASE I.—Reported before the Section on Surgery, New York Academy of Medicine, March, 1895 (*Medical Record*, p. 475, 1895).

Male, eight and a half months old, seen on the fourth day of the disease. Enemata had been unsuccessfully employed. No tumor was palpable either through the abdominal wall or per rectum. Coeliotomy was performed, and an intussusception of the enteric variety found in the left hypochondriac region. The mass was partially reducible; the remaining irreducible portion, almost six inches in length, was gangrenous. This gangrenous portion was removed and an end-to-end anastomosis with the Murphy button done. Septic peritonitis existed at the time of the operation. Death occurred within twelve hours.

CASE II.—Reported in the *New York Medical Journal*, April 16, 1898. F., male, aged nine years, was seized at four o'clock, Friday afternoon, August, 1897, with colicky pain in the abdomen, limited to the right side and of rather severe character. During the night he vomited the contents of the stomach and some bile, and passed a large quantity of blood and clots by the bowel. There was marked tenesmus and frequent attempts to have a movement of the bowels throughout the following day, but with no further result than the passing of mucus and blood. His temperature was said to have been normal, while the pulse was slightly increased. On Sunday his condition showed all the evidences of severe shock, and upon palpating the abdomen a rather elongated tumor could be mapped out in the right side. In the absence from the city of Dr. Carl Beck the case was referred to me by the family physician. I saw the patient at nine o'clock on Sunday night, and found the following condition: Countenance anxious, temperature  $101^{\circ}$  F., pulse 128, abdomen distended and tympanitic, painful to the touch, and a sausage-shaped tumor extending from the right iliac fossa to the costal cartilage of the tenth rib. I had the patient transferred to St. Mark's Hospital, opened the abdomen at ten o'clock, about fifty-eight hours after the onset of the symptoms, and found an intussusception of the enteric variety, the apex of which was within six inches of the ileo-caecal junction.

The mass was irreducible and gangrenous, and the mesentery was gangrenous to within an inch of its attachment to the lumbar column.

In addition, the intestines were deeply engorged and a quantity of pus was found in the cavity. Resection of the mass and an end-to-end anastomosis with the Murphy button was performed, the abdomen thoroughly washed out with salt solution, and a gauze pack placed down to the anastomosis. The patient bore the operation very well and reacted nicely. During the two days following the operation he was given sixty cubic centimetres of Marmorek's serum without any evidences of improvement. The condition of sepsis increased, and the patient expired at the end of the fourth day following the operation.

Upon examining the specimen a mass of about two inches long was seen protruding at the distal extremity, which was made out to be a Meckel's diverticulum that had become inverted, and evidently was



FIG. 1.—Specimen of intussusception, 1, Intussuscipiens; 2, ileum; 3, Meckel's diverticulum (inverted) and intussuscepum.

the cause of the intussusception. Upon cutting the specimen open, it was found to measure thirty-three inches in length. This extreme length was due to the tight manner in which the intussusceptum was packed in the ensheathing intussuscipiens. (Figs. 1 and 2.)

**CASE III.**—Female, aged four months, seen September 18, 1897. Condition extremely bad. Rapid, feeble pulse; cyanosis; apathetic. Temperature  $101^{\circ}$  F.; abdomen distended, quite tympanitic. No tumor upon palpation, due to abdominal distention. Previous history vague; had been ill for a week or more. The family stated that seventeen physicians had seen the patient during her illness. A diagnosis of intussusception had been made by the majority, and operation advocated by some, but was refused. Finally the family begged that an operation be performed. This was done within an hour of admis-

sion, and an ileo-caecal intussusception found, readily reducible; but a general septic peritonitis existed, and death followed within twelve hours.

CASE IV.—Female, seventeen weeks old, well-nourished. Had had a previous day of diarrhoea, and was seized with pain, restlessness, and bloody, mucous dejections. Sent to the writer by Dr. Francis Huber, February 18, 1898. Enemas had been unsuccessfully tried. No mass or tumor palpable either by rectum or abdominal wall. Operation performed within the first eighteen hours; tumor found in right hypochondriac region, and was of the ileo-caecal variety. Reduced readily. Patient stood the operation nicely, but was taken ill with pneumonia; then another lobe became involved; finally, recovery resulted. Suppuration occurred in the superficial layers of the wound. Discharged in five weeks.

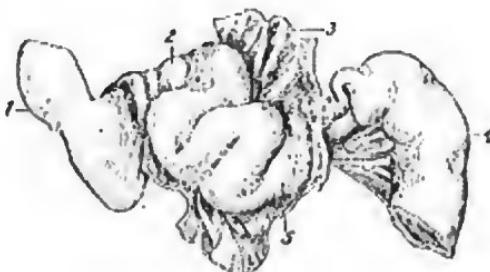


FIG. 2.—1, Meckel's diverticulum; 2, intussusceptum; 3, intussipiens split open; 4, ileum.

CASE V.—Female, exactly five months old. Sent to the writer by Dr. Joseph Huber, February 23, 1898. Patient had suffered from tetany for some weeks. Bottle-fed and poorly nourished. History of previous diarrhea and of intussusception of a few hours' duration. When seen by the writer there was pain, restlessness, blood-tinged mucous stools, but no tumor upon abdominal palpation. By digital examination a protruding mass, high in the bowel, could just be felt. Several enemas were given, and upon digital examination the protrusion could not be felt. She was placed in bed and slept quietly for eight hours. Upon awakening she became restless, and had a blood-tinged mucous stool. Operation was performed. The tumor was found in the left hypochondriac region, extending down to the lumbar region. It was of the ileo-caecal variety. The tumor was fixed in this region, and, upon searching for the cause of its irreducibility, it was

found that a hernia of the small intestine had taken place through the foramen of Winslow. Several coils being reduced before the fixation of the intussusception could be relieved, the tumor was readily displaced and reduced by pressure through the intussuscipiens upon the apex of the intussusceptum. This child also recovered, but during three weeks following the operation there was absolutely no evidence of union in the abdominal wound. The intestines protruded upon several occasions. Secondary sutures were placed twice, and upon two occasions blue pus was present upon the dressings. During the third week repair began. The child was discharged between the sixth and seventh weeks.

CASE VI.—Male, thirty-eight years of age, admitted to Gouverneur Hospital, March 17, 1898. When seen by the writer he stated that he had had colicky pain that morning. Examination: Slight evidence of shock; pain in abdomen; local tenderness in left hypogastric and lumbar regions; vomiting; had a rather large bloody mucous stool. Palpation: Very sensitive upon left side; a tumor elongated in shape could be felt in the left lumbar region. Three pints of saline solution were given after a three-pint simple enema; both were negative in results. Bloody stools continued at intervals. Operation not indicated by patient's general condition. March 18: Three-pint injection of salt water followed by bloody mucus only. Pain eased some. March 19: Enema of three pints of soap and water. Pulse 100.2° F. Tumor disappeared. Calomel, ten grains, and eleterin, one-tenth of a grain, were given. March 20: Large movement. March 21: Patient discharged.

CASE VII.—This case occurred in the practice of Dr. M. Dantes during March, 1898, who cited the history to me with a view to treatment. Female, aged three and one-half months, ill two days when seen by Dr. Dantes. She had had diarrhea, and vomited a few times during these days. When seen there were bloody, mucous stools, pain, and restlessness. No tumor found by abdominal palpation, but evidences by rectal examination. Enema proved of no avail. Operative interference refused; child died on the twelfth day of the disease with all the evidences of a septic peritonitis. During the latter days of her life foul-smelling discharges were evacuated, but no sloughs.

CASE VIII.—This case was referred to me by Dr. Eynon, and is the one to which reference was made, in the beginning of this paper, of opium masking the symptoms.

Patient was a male, four months and four days old, born in the United States, of Irish-American parents. The onset was at 3 P.M.

on a Monday, with considerable shock, some vomiting, and bloody stools. Two hours later high enemas were given, apparently with success, as the shock and pain were mitigated. The tumor, palpable through the abdominal wall and also through the rectum, reappeared and was again treated with like result. This recurrence and apparent reduction occurred several times,—four or five (?). The child was given minim doses of paregoric. On Tuesday—*i.e.*, the following morning—shock and pain were decided, tumor was present, bloody faeces were evacuated. When I saw the child, at or about 4 p.m. on Tuesday, or about twenty-five hours after the onset, a tumor was palpable through the abdominal wall upon very deep pressure, and could be outlined by rectal and abdominal palpation. The child's condition was apparently excellent, the mother stating that he had slept for some time previous to our visit; that there had been a little vomiting and a small, slimy, blood-tinged stool. Pulse and respiration were good. Enemas were used again with what appeared to be a reduction, no tumor being palpable afterwards. The child was put to bed and slept. We remarked at the time that even if the opium was given in small quantity, that the symptoms could be so masked as to cause regret for not operating, and that we would keep prepared for emergency until the following day. At 9.30 of the same day we were again called, and found the original condition of the tumor, with a manifestly bad condition of the child (opium had been withdrawn at our first visit). A median incision was made, a tumor of the ileo-colic variety was found, with several lacerations of the serosa and musculosa of the intussusciptiens, the gut was edematous, omentum markedly congested, and a bloody serous fluid in the abdomen.

We were able to reduce the mass with some difficulty, then sutures were taken in the intestinal walls at the sites of lacerations, and the toilet of the peritoneum, etc., made. The operation occupied less than thirty minutes; the child was returned in a fair condition, but died of sepsis within eighteen hours after the operation.

CASE IX.—Through the kindness of Dr. Joseph D. Bryant the following case was seen and operated upon by me in August of this year:

Fred. S., ten months old, born in the United States, of Polish parents. On August 16, at 4 p.m., was seized with an attack of screaming, and showed evidence of great pain, which was referred to the abdomen. The family physician, Dr. Friedman, called in Dr Bryant, who very kindly referred the case to my service in Gouverneur Hospital. When I saw the child, at twelve o'clock midnight, the fol-

lowing symptom complex was present: Child was in a mild degree of shock, pulse rapid but of good quality, restless.

Palpation revealed a tumor in the left upper quadrant of the abdomen; the abdomen was painful upon manipulation. The mass could not be felt by digital examination at this time. Some bloody mucus was present.

All preparations for abdominal section were made. Water was unsuccessfully used, and laparotomy was done. An incision three inches in length was made in the median line, the tumor readily located with the examining finger, but was so firmly fixed as to prevent its displacement through the incision. Reduction was tried by pressure, with the result of being able to reduce the size of the tumor to about one-quarter of its length, and to cause the mass to recede from its left upper quadrant position to the right lumbar. At this time we were able to displace the remaining mass through the incision, and reduce it without a particle of trouble. It was of the ileo-caecal variety, the appendix and ileo-caecal junction being the last portions reduced. The abdominal wound was sewed in three layers, a buried suture being used in the skin. Rubber protective was placed upon the line of the wound to prevent infection by means of urine, etc. The dressings were not removed until the fourteenth day, when the patient was discharged.

It will be seen by the following table that of nine cases one recovered by injections, or 11 per cent.; one died after injections, having refused operation. Seven cases were operated upon, with three recoveries, practically 43 per cent. Of the four deaths, it can be said that two had practically no chance for recovery, and the third but a very slight chance. There were three (Cases I, II, and III) septic at the time of operation, Cases I and II being gangrenous. In Case VIII, the case cited as having had opium, the symptoms being masked to such a degree as to deceive us as to the patient's actual condition, thereby causing a delay of eight hours in the operation.

In four of the reported cases a tumor was palpable, and in two of the cases in which tumor could not be felt on palpation the tip of the intussusceptum could be felt by rectal examination.

Had we to operate again in Cases I and II, we would not have resected, but established an artificial anus.

It will also be noted that children of Polish parentage suffer

more than of the mixed races 5 to 4. This may be accounted for by my region of supply being in a neighborhood infested with this class, although all the cases, but one, were sent me as private patients. Sex was almost equally divided, five being in males and four in females. As before stated, the ileo-colic variety was most frequently represented; one being ileo-cæcal, four ileo-colic, two enteric, and two unknown.

It is also interesting to note that 50 per cent. of recoveries occurred in the cases of infants, one of the reported deaths being in a lad nine years of age.

#### SYNOPSIS OF CASES.

CASE I.—Age, eight and one-half months. Sex, male. Born in United States. Parents, Irish-American. Duration, four days. Condition of patient, septic. Tumor palpable, no. Water tried, unsuccessful. Operation, yes. Condition of gut, gangrenous. Variety, enteric. Reduced, no. Resection, yes, Murphy button. Result, death in twelve hours.

CASE II.—Age, nine years. Sex, male. Born in United States. Parents, German. Duration, two and a half days. Condition of patient, septic. Tumor palpable, yes. Water tried, unsuccessful. Operation, yes. Condition of gut, gangrenous. Variety, enteric. Reduced, no. Resection, yes, Murphy button. Result, died on fourth day.

CASE III.—Age, four months. Sex, female. Born in United States. Parents, Poles. Duration, seven days. Condition of patient, septic. Tumor palpable, no. Water tried, unsuccessful. Operation, yes. Condition of gut, congested and œdematosus. Variety, ileo-cæcal. Reduced, readily. Resection, no. Death in twelve hours.

CASE IV.—Age, seventeen weeks. Sex, female. Born in United States. Parents, Poles. Duration, eighteen hours. Condition of patient, fair. Tumor palpable, no. Water tried, unsuccessful. Operation, yes. Condition of gut, congested and œdematosus. Variety, ileo-colic. Reduced, readily. Resection, no. Result, recovered, complicated with pneumonia.

CASE V.—Age, five months. Sex, female. Born in United States. Parents, Poles. Duration, twenty hours. Condition of patient, poorly nourished. Tumor palpable, no; felt by rectum. Water tried, unsuccessful. Operation, yes. Condition of gut, congested and œdematosus. Variety, ileo-colic. Reduced, readily. Resection, no. Result, recovered.

CASE VI.—Age, thirty-eight years. Sex, male. Born in Poland. Parents, Poles. Duration, sixteen hours. Condition of patient, good. Tumor palpable, yes. Water tried, successful. Operation, no. Result, recovered.

CASE VII.—Age, three and one-half months. Sex, female. Born in United States. Parents, German. Duration, two days. Condition of pa-

tient, fair. Tumor palpable, no; felt by rectum. Water tried, unsuccessful. Operation, refused. Result, death on twelfth day.

CASE VIII.—Age, four months, four days. Sex, male. Born in United States. Parents, Irish-American. Duration, thirty-six hours. Condition of patient, apparently good. Tumor palpable, yes. Water tried, unsuccessful. Operation, yes. Condition of gut, congested, oedematous; two large lacerations of wall; peritonitis. Variety, ileo-colic. Reduced, some difficulty. Resection, no. Result, died; small doses of paregoric; marked symptoms.

CASE IX.—Age, ten months. Sex, male. Born in United States. Parents, Poles. Duration, ten hours. Condition of patient, good. Tumor palpable, yes. Water tried, unsuccessful. Operation, yes. Condition of gut, oedematous and congested. Variety, ileo-colic. Reduced, readily. Resection, no. Result, recovered.

Total, five males and four females. Tumors in four palpable; in five, not; in two by rectum. Water tried, in one successful, in eight unsuccessful. Operated on, seven; refused, one. Reduced with enemas, one. Variety, ileo-colic, four; ileo-caecal, one; enteric, two; unknown, two. Reduced by operation, five; two not; one by water; one not by water. Resections, two. Result, three operative recoveries; one enema recovery; four operative deaths; one non-operative death; recoveries by operation, forty-three per cent.